FROM THE MAKERS OF **WOLFRAM LANGUAGE** AND **MATHEMATICA**

WolframAlpha

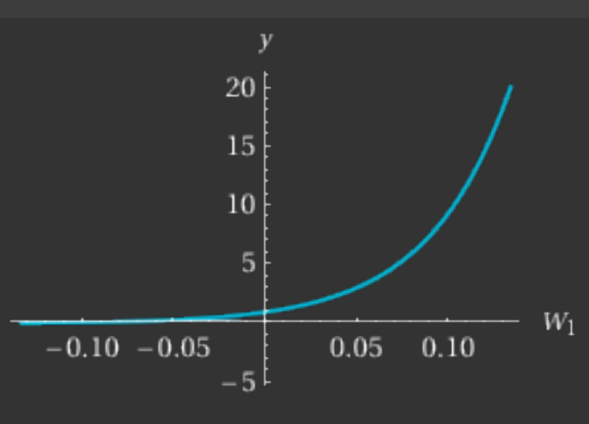
e^(w_1 ((pi)^e))

Assuming "W" is a variable

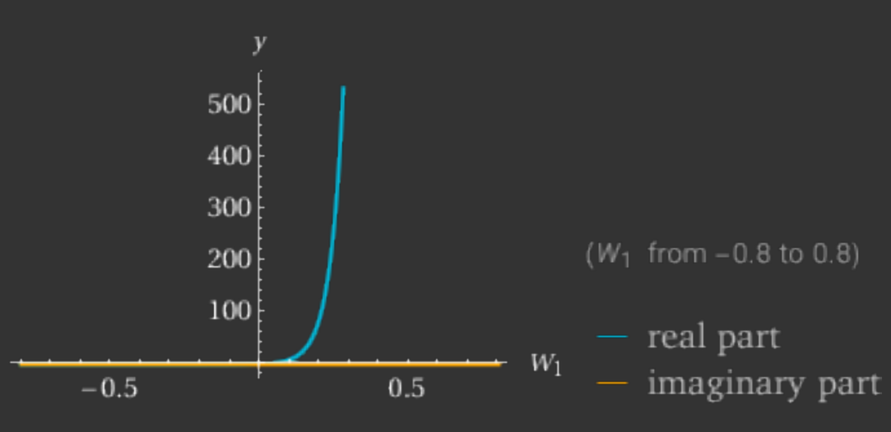
## Input

$e^{W_1 \pi^e}$

## Plot




($W_1$ from −0.1 to 0.1)




($W_1$ from −0.8 to 0.8)

## Roots

(no roots exist)

Step-by-step solution

## Periodicity

periodic in $W_1$ with period $2\, i\, \pi^{1-e}$

Approximate form

## Series expansion at $W_1$=0

$$1 + \pi^e W_1 + \frac{1}{2} \pi^{2e} W_1^2 + \frac{1}{6} \pi^{3e} W_1^3 + \frac{1}{24} \pi^{4e} W_1^4 + O(W_1^5)$$

(Taylor series)

## Derivative

$$\frac{d}{dW_1}\left(e^{W_1 \pi^e}\right) = \pi^e e^{\pi^e W_1}$$

Approximate form | Step-by-step solution

## Indefinite integral

$$\int e^{W_1 \pi^e} \, dW_1 = \pi^{-e} e^{\pi^e W_1} + \text{constant}$$

## Limit

$$\lim_{W_1 \to -\infty} e^{\pi^e W_1} = 0$$

## Alternative representations

$$e^{W_1 \pi^e} = z^{W_1 \pi^e} \quad \text{for } z = e$$

$$e^{W_1 \pi^e} = w^a \quad \text{for } a = \frac{\pi^e W_1}{\log(w)}$$

$$e^{W_1 \pi^e} = 1 + \frac{2}{-1 + \coth\left(\frac{\pi^e W_1}{2}\right)}$$

$$e^{W_1 \pi^e} = -1 + \frac{2}{1 - \tanh\left(\frac{\pi^e W_1}{2}\right)}$$

$$e^{W_1 \pi^e} = 1 - \frac{2}{1 + i \cot\left(-\frac{1}{2} i \pi^e W_1\right)}$$

$$e^{W_1 \pi^e} = -1 + \frac{2}{1 - i \tan\left(-\frac{1}{2} i \pi^e W_1\right)}$$

$$e^{W_1 \pi^e} = \operatorname{cd}\left(i \pi^e W_1 \,\middle|\, 0\right) - i \operatorname{cd}\left(\frac{\pi}{2} - i \pi^e W_1 \,\middle|\, 0\right)$$

$$e^{W_1 \pi^e} = \frac{1}{\operatorname{cn}\left(\pi^e W_1 \,\middle|\, 1\right)} + \frac{i}{\operatorname{cn}\left(\frac{i\pi}{2} - \pi^e W_1 \,\middle|\, 1\right)}$$

Less

## Series representations

$$e^{W_1 \pi^e} = \sum_{k=0}^{\infty} \frac{\pi^{e k} W_1^k}{k!}$$

$$e^{W_1 \pi^e} = \sum_{k=-\infty}^{\infty} I_k(\pi^e W_1)$$

$$e^{W_1 \pi^e} = e^{z_0} \sum_{k=0}^{\infty} \frac{(\pi^e W_1 - z_0)^k}{k!}$$

$$e^{W_1 \pi^e} = \sum_{k=0}^{\infty} \frac{\pi^{e(-1+2k)} W_1^{-1+2k} (2k + \pi^e W_1)}{(2k)!}$$

$$e^{W_1 \pi^e} = \sum_{k=0}^{\infty} \frac{\pi^{2ek} W_1^{2k} (1 + 2k + \pi^e W_1)}{(1+2k)!}$$

$$e^{W_1 \pi^e} = I_0(\pi^e W_1) + 2 \sum_{k=1}^{\infty} I_k(\pi^e W_1)$$

$$e^{W_1 \pi^e} = \sum_{j=0}^{\infty} \operatorname{Res}_{s=-j} \pi^{-es} \Gamma(s) (-W_1)^{-s}$$

$$e^{W_1 \pi^e} = 1 + \sqrt[m]{m! \sum_{k=m}^{\infty} \frac{\pi^{ek} S_k^{(m)} W_1^k}{k!}} \quad \text{for } (n \in \mathbb{Z} \text{ and } m \geq 0)$$

Less

## Integral representations

$$e^{W_1 \pi^e} = e^{2^e \left(\int_0^\infty 1/(1+t^2)\, dt\right)^e W_1}$$

$$e^{W_1 \pi^e} = e^{4^e \left(\int_0^1 \sqrt{1-t^2}\, dt\right)^e W_1}$$

$$e^{W_1 \pi^e} = e^{2^e \left(\int_0^\infty \sin(t)/t\, dt\right)^e W_1}$$

$$e^{W_1 \pi^e} = e^{2^e \left(\int_0^\infty \sin^2(t)/t^2\, dt\right)^e W_1}$$

$$e^{W_1 \pi^e} = e^{3^e \left(\int_0^\infty \sin^4(t)/t^4\, dt\right)^e W_1}$$

$$e^{W_1 \pi^e} = e^{(8/3)^e \left(\int_0^\infty \sin^3(t)/t^3\, dt\right)^e W_1}$$

$$e^{W_1 \pi^e} = e^{(40/11)^e \left(\int_0^\infty \sin^6(t)/t^6\, dt\right)^e W_1}$$

$$e^{W_1 \pi^e} = e^{(384/115)^e \left(\int_0^\infty \sin^5(t)/t^5\, dt\right)^e W_1}$$

Less

## Definite integral

$$\int_{-\infty}^{0} e^{\pi^e W_1} \, dW_1 = \pi^{-e} \approx 0.0445253$$

More digits

## Definite integral over a half-period

$$\int_0^{i \pi^{1-e}} e^{\pi^e W_1} \, dW_1 = -2 \pi^{-e} \approx -0.0890505$$

More digits

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